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EXPERIMENT:

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## Ternary Mixture-I

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° Type :- solid - solid - solid mixture

° Solubility Tests:

Tests	Observation	Inference
Take small amount of mixture + water shake & allow to stand	solid does not dissolve	water insoluble solid is present

Conclusion: All the compounds in the mixture are water insoluble solid

° Determination of chemical Type:-

(Three water insoluble solid compound)

Tests	Observation	Inference
i) About 0.01 g of mix + 1-2 cm <sup>3</sup> sat. NaHCO <sub>3</sub> shake till effervescence stops. Filter	i) strong effervescence before filtrate with conc HCl → a solid reappears	carboxylic acid is present.
ii) Residue from test (i) washed to remove acid. Remaining residue + 2 cm <sup>3</sup> of 10% NaOH. shake & filter.	Acidifying filtrate with 1:1 HCl & cooling → a solid reappears	phenolic compound is present
iii) Residue from test (ii) washed with NaOH remove phenol. Residue + 2 cm <sup>3</sup> 1:1 HCl shake & filter	Filtrate cooled in ice + 20% NaOH & cool in ice bath → No solid reappears	Base compound is absent



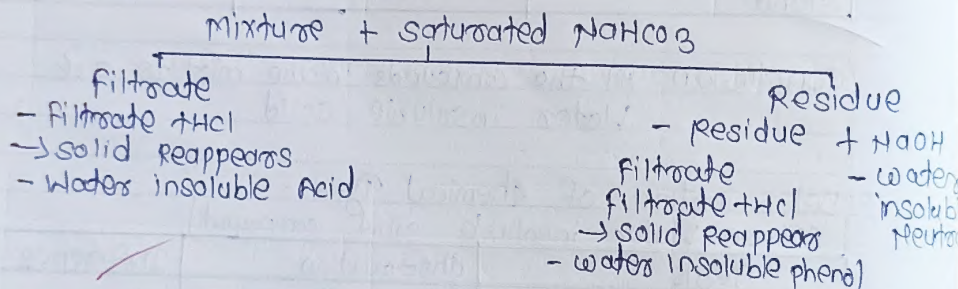
iv	Residue washed 2-3 times aq. HCl to remove base. Remaining residue is insoluble in all above reagents.	-	Neutral compound is present.
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Conclusion :- chemical type of given mixture is

- i) Water insoluble acid solid.
- ii) Water insoluble phenol solid.
- iii) Water insoluble neutral solid.

• separation of solid - solid - solid mixture :

A - separation method :-



B. Yield of the separating compound :-

- i) Weight of water insoluble Acid = 0.9 g
- ii) Weight of Water insoluble phenol = 0.7 g
- iii) Weight of Water insoluble Neutral = 0.9 g

• Identification of organic compound :-  
(Water insoluble Acid)

Tests	Observations	Inferences
Nature	Solid	Carbohydrates, acid, etc. may be present.
Colour	White	Carbohydrates, Acid amides, etc. may be present.



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Odours	Pungent & irritating	Acetic acid, Benzoid Acid etc. may be present.
Ignition test:- Heat compound on an oxidised copper foil	Sooty flame is observed	Aromatic compound or aliphatic comp contain more than four carbon atom
Test for unsaturation: KMnO <sub>4</sub> Test:- Add few drops of dilute KMnO <sub>4</sub> to small amount of compound & shake	Decolourisation	unsaturated or easily oxidisable compound may be present.

• Detection of elements (N, S & Halogens):-

preparation of Lassaigne filtrate (sodium fusion extract):-

- i) Heat a small amount of sodium metal piece in dry fusion tube till it melts.
- ii) Add small amount of dry substance of molten sodium
- iii) After initial reaction has subsided, Heat the fusion tube further to red heat & then drop it in 5 cm<sup>3</sup> of distilled water taken in porcelain dish covering it immediately with an asbestos sheet.
- iv) carry out two more fusion in the similar way & concentrate the contents of the dish to half its volume.
- v) cool & filter, Test the filtrate for litmus action At this stage, it should be basic.
- vi) Test the filtrate for the detection of elements.

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Tests	Observation	Inference
0.5 cm <sup>3</sup> Fehling's freshly prepared sol. + 5% aq. sol. of H <sub>2</sub> O <sub>4</sub> is added	No green coloured is observed	Nitrogen is absent.
0.5 cm <sup>3</sup> Fehling's + 2-3 drop of 5% sodium nitroprusside solution	No violet colour is observed	Sulphur is absent.
0.5 cm <sup>3</sup> Fehling's + conc. HNO <sub>3</sub> + AgNO <sub>3</sub> solution	precipitate is not obtained	Halogen is absent.

Conclusion:- The given compound contains C, H, [O] elements.

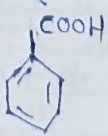
• Determination of the functional group of compound:-

Group I:- compounds containing C, H, [O] elements:-

Tests	Observation	Inferences
Test for carboxylic acid groups:- i) compound + sat. NaHCO <sub>3</sub>	Soluble with brisk effervescence	Carboxylic acid - COOH present.
ii) compound + H <sub>2</sub> O + few drop of neutral FeCl <sub>3</sub> solution.	Buff colour	Benzoic acid is present.

Conclusion:- The given compound contains Ar-COOH functional group.

• Physical constant:-

Melting point	Name and structure of the compound
121°C	Benzoic acid 



- Identification of organic compound :-  
(Water insoluble phenol)

- Preliminary test :-

Test	Observation	Inference
Nature	Solid	carbohydrate, phenol acids etc. may be present.
Colour	Buff	Amino, phenols, naphthols amines etc may be present
Odours	Carbolic	phenols & naphthols may be present.
Ignition Test:-		Aromatic or aliphatic compound containing more than 4 carbon atoms.
Heat compound on an oxidised copper foil.	sooty flame is observed	
Test for unsaturation		unsaturated or easily oxidisable
kmno <sub>4</sub> Test:		
Add few drops of kmno <sub>4</sub> to small amount of compound & shake.	Decolourisation	compound may be present.

- Detection of elements (N, S & Halogens):-

preparation of Lassaigne filtrate (Sodium fusion extract)

- Heat a small piece of sodium metal in dry fusion tube
- Add small amount of dry substance to molten sodium
- After that heat the tube to red heat & then drop in distilled water taken in porcelain dish covering it immediately with asbestos sheet.



iv) carry out two more fusion in similar way & concentrate the content of dish to half in volume.

v) cool & filter. Test the filtrate for litmus action, it should be basic.

vi) test the filtrate for the detection of elements.

Tests	Observation	Influence
0.5 cm <sup>3</sup> filtrate + freshly prepared sat. FeSO <sub>4</sub> sol <sup>n</sup> & cool & add excess of dil. H <sub>2</sub> SO <sub>4</sub>	No blue colour is observed	Nitrogen is absent.
0.5 cm <sup>3</sup> filtrate + drops of 5% sodium metavanadate	No violet colour is observed	Sulphur is absent.
0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> Add AgNO <sub>3</sub> sol <sup>n</sup>	precipitate is not obtained	Halogen is absent.

Conclusion:- The given compound contains C, H, [O] elements.

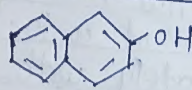
• Determination of the functional group of compound:-

Group I :- compounds containing C, H, [O] elements:-

Tests	Observation	Inference
Test for phenolic group		
i) compound + NaOH solution	Easily soluble	phenolic - OH present.
ii) compound + H <sub>2</sub> O + drops of alcoholic FeCl <sub>3</sub> solution	Buff precipitate	phenolic - OH present

Conclusion:- The given compound contains phenol group.

• Physical constant:-

Melting point	Name & structure of compound
123°C	β-naphthol 



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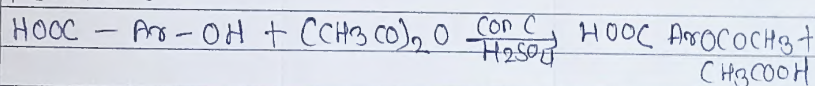
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Derivative of Water Insoluble Acid:-  
(Acetyl derivative of hydroxy Acid):-

• procedure:

- Take 1 g of compound in dry test tube.
- Add 2 cm<sup>3</sup> of acetic anhydride & 1 drop of conc H<sub>2</sub>SO<sub>4</sub> to it.
- Heat to boiling, cool & pour the content into 10 cm<sup>3</sup> of cold water in a dish.
- If solid does not separate out, Heat for 2 min more cool and shake well.
- Filter the solid product, wash with water.
- Dry & determine the melting point.

• Reaction:



• Physical constant:

The melting point of acetyl derivative of hydroxy acid is 123°C

• purification of compound:

- purified compound: Water insoluble Neutral
- Method of purification: recrystallization
- yield of purified product: 0.7 g



iv) melting point of product : 80°C




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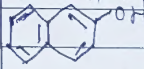
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## • Results :

## • Identified compound :

Compound identification	Elements detected	Functional group	Physical constant	Name & Structure of compound	Derivative prep with melting point.
Water Insoluble Acid	Carbon, Hydrogen, Oxygen (C)	Ar-COOH	Melting Point = $121^{\circ}\text{C}$	Benzoic Acid 	Acetyl derivative of Hydroxy acid Melting point = $123^{\circ}\text{C}$

## • Identified compound :-

Compound identification	Elements detected	Functional group	Physical constant	Name & Structure of compound
Water Insoluble phenol	Carbon, Hydrogen, Oxygen (C)	phenol	Melting point = $123^{\circ}\text{C}$	$\beta$ -naphthol 

## • purified compound :-

purified compound	Yield of compound	physical constant
Water Insoluble Neutral	0.7 g	Melting point = $80^{\circ}\text{C}$

pure



Type : Solid-Solid-Solid mixture

Solubility Test :

Tests	Observation	Inference
i) Take small amount of mixture + water shake & allow to stand	Solid does not dissolve	water insoluble Solid may be present
ii) Aqueous layer from above test, heat in porcelain dish till water gets evaporate	Solid reappears	water insoluble Solid is present

Conclusion :- In the given mixtures, there is one water soluble solid & two water insoluble solid

For water soluble solid,

Molish Test :

Aqueous layer from above test + $\alpha$ -naphthol in ethanol + 6 drop of conc. $H_2SO_4$	Ring is formed	Carbohydrates is present
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Determination of chemical type :

(one water soluble solid + 2 water insoluble solid)

Test	Observation	Inference
For water soluble solid : 0.01 g mix + $H_2O$ shake & filters		
i) Filtrate + sat NaHCO <sub>3</sub>	No effervescence	carboxylic acid absent



i) Filtrate + aq. FeCl <sub>3</sub> sol <sup>n</sup>	No violet colour	phenol absent
ii) Filtrate + red litmus	No change	Base absent
iii) None of above test is positive	-	Neutral Compound is present
For waters insoluble solid		
i) mixture + sat. NaHCO <sub>3</sub> shake till effervescence stop filters	on acidifying with conc. HCl → a solid does not reappear	carboxylic acid absent
ii) Residue from above test washed 2-3 times with NaHCO <sub>3</sub> . Residue + 10% NaOH. Shake & filters	on acidifying with HCl & cooling → solid reappears	phenolic compound is present
iii) Residue from above test washed with NaOH to remove phenol. Residue + 1:1 HCl. Shake well & filters	Filtrate cooled in the ice + 20% NaOH drop by drop till alkaline → solid reappears	Basic compound is present

Conclusion : chemical type of given mixture is

- i) waters soluble Neutral solid
- ii) waters insoluble phenol solid
- iii) waters insoluble Base solid

Separation of solid-solid mixture :

A. Separation method :

Mixture + diethyl ether

Filtrate

- Evaporate the filtrate
- Solid reappears
- waters Soluble neutral

Residue  
- Residue + NaOH  
Filtrate  
- Filtrate + HCl  
→ solid reappears  
- waters Insoluble Phenol

Residue  
- waters Insoluble Base



B. Yield of the Separating compound :-

- i) weight of waters soluble solid neutral = 0.9 g
- ii) weight of waters Insoluble phenol = 0.7 g
- iii) weight of waters Insoluble Base = 0.8 g

• Identification of organic compound : I  
(waters Insoluble phenol)

Tests	observations	Inferences
Nature	Solid	Carbohydrates, phenol acids, amides etc.
Colour	Buff or reddish brown	may be present. Amino phenol, amino acids, amines etc.
odour	Carbolic	phenols & naphthol
ignition test		Aromatic or aliphatic
Heat compound on an oxidised copper foil	sooty flame	Containing more than four carbon atoms.
Test for unsaturation kmno4 test:		Unsaturated or easily oxidisable
Add few drops of dilute kmno4 to small amount of the compound & shake	Decolourisation	Compound may be present.

- Detection of Elements (N, S, & halogen) :  
Preparation of Lassaigne Filtrate (Sodium fusion Extract)  
i) Heat small piece of Sodium metal in fusion tube till it melts.

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- i) Add small amount of dry substance to molten
- ii) Heat fusion tube till it turns red hot & then clear distilled water taken in porcelain dish to half in immediately with an abbe's sheet.
- iii) Concentrate the content to half its volume.
- iv) Cool & filter. Test the filtrate for litmus action it be basic.
- v) Use the filtrate for further tests:

Tests	Observations	Inferences
0.5 cm <sup>3</sup> filtrate + sat. FeSO <sub>4</sub> , boil, cool & add. excess of dil. H <sub>2</sub> SO <sub>4</sub>	No blue colour	Nitrogen absent
0.5 cm <sup>3</sup> filtrate + 5% of sodium nitroprusside solution	No violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> . Add AgNO <sub>3</sub>	No precipitate	Halogen absent

Conclusion: The given compound contains C, H, Cl elements.

• Determination of functional group of compounds:

Group I: compound containing C, H, Cl elements.

Tests	Observations	Inferences
Test for phenolic groups: i) Compound + NaOH	Easily soluble	phenolic -OH present
ii) Compound + H <sub>2</sub> O + drop of alcoholic FeCl <sub>3</sub>	Buff precipitate	phenolic -OH present

Conclusion: The given compound contains phenolic group

physical constant

melting point Name and structure of the compound

120°C β-naphthol



- Identification of organic Compound : II  
(water Insoluble Base)

Tests	Observations	Inferences
Nature	Solid	Carbohydrates, phenols, acids, amines, etc. may be present.
Colour	yellow	Nitroso Compounds, di ketones, etc.
Odours	Fishy	Amines, aniline, etc.
Ignition Test : Heat compound on oxidised copper foil	Sooty flame	Aromatic or aliphatic compound containing more than four carbon
Test for unsaturation		
KMnO <sub>4</sub> Test : Add drops of dil. KMnO <sub>4</sub> to small amount of compound & shake	Decolourisation	unsaturated or easily oxidisable compound may be present.

- Detection of Elements (N, S and halogen)  
Preparation of Lassaigne filtrate (Sodium fusion Extract):  
    - Heat small piece of sodium metal in dry fusion tube till it melts.
    - Add small amount of dry substance to molten sodium.
    - After initial reaction, heat it to red hot & drop in distilled water taken in porcelain dish covering immediately with asbestos sheet.
    - Crush out two more & concentrate the content of the dish to half its volume.



✓ cool & filter test filtrate if it is basic.  
 ✓ use filtrate for following reactions.

Tests	Observations	Inferences
0.5 cm <sup>3</sup> filtrate + Fresh FeSO <sub>4</sub> , boil, cool & add excess of dil. H <sub>2</sub> SO <sub>4</sub>	Green colour	Nitrogen present
0.5 cm <sup>3</sup> filtrate + 5% Sodium nitroprusside solution	No violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc HNO <sub>3</sub> + AgNO <sub>3</sub> solution	No precipitate	Halogen absent

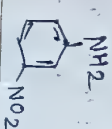
Determination :- the given compound contain C, H, [O] & n elements.

• Determination of functional group of compound :-  
 Group II : Compounds containing C, H, [O] & N elements.

Tests	Observations	Inference
Test for Amines Dissolve compound in dil. HCl, cool in ice + cold 2% NaNO <sub>2</sub> soln.	A clear solution which when added to soln of $\beta$ -naphthol in NaOH give orange red dye	Aromatic primary amino (C-NH <sub>2</sub> ) group present.

Conclusion :- the given compound contain aromatic primary amine group.

• Physical constant :

Melting point	name & structure of the compound
114°C	m-nitro aniline 

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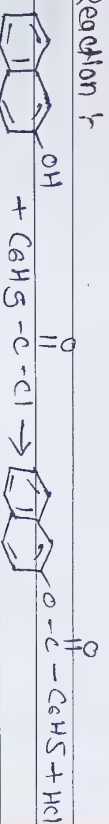
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- Derivative of water insoluble phenol :-  
(Benzoyl derivative of phenol) :-

- procedure :-

- Dissolve 0.5 cm<sup>3</sup>/g of compound in 10 cm<sup>3</sup> of 10% NaOH in a 100 cm<sup>3</sup> conical flask.
- Add 1 cm<sup>3</sup> of benzoyl chloride to it & cork flask
- Shake flask vigorously till the smell of benzoyl chloride disappears completely.
- Filter the solid under suction & wash it first with dil. HCl & then with water.
- Recrystallise the product from alcohol. Dry & determine the melting point.

- Reaction :-



- Physical constant :-  
the melting point of benzoyl derivative of phenol is 107°C.

- Purification of Compound :-  
purified compound : water soluble Neutral

- method of purification : Recrystallization

- weight of purified product : 0.8 g

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iv) melting point of product :-  $140^{\circ}\text{C}$

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## Results :-

## Identification Compound : I

Compound	Elements	Functional Group	Physical Constant	Name & Structure	Derivative prepared with
Identification	Detected	Group	Constant	Structure & Name	Derivative prepared with
soluble	Carbon C,	phenolic	melting point	p-nitrophenol	Derivative prepared with
Insoluble	Hydrogen H, (C-OH)		point	phenol	Derivative prepared with
phenol	oxygen(O)	group	=128°C		Derivative prepared with
			=107°C		

## Identification Compound : II

Compound	Elements	Functional Group	Physical Constant	Name & Structure
Identification	Detected	Group	Constant	Structure & Name
soluble	Carbon C,	Aromatic	melting point	m-nitroaniline
Insoluble	Hydrogen H, primary		point	
Base	oxygen(O) amine		114°C	
	Nitrogen N (-NH <sub>2</sub> )	Group		

## Purified Compound

Purified compound	Yield of compound	Physical constant
crystals Soluble	0.8 g	melting point -146°C
neutral		

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## Ternary mixture-III

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Type : Solid - Liquid mixture

Solubility test :

Tests	Observations	Inferences
i) mixture + H <sub>2</sub> O Shake well & allow to stand	a) solid does not dissolve b) No layers formed	water insoluble solid present.. water miscible liquid present.
ii) Aqueous layer from above test is heated till the liquid evaporate	solid not reappears	water insoluble solid present.

Conclusion : The compounds in the mixture are water  
insoluble solid, water insoluble solid &  
water miscible liquid

Determination of chemical type :

(water insoluble solid + water insoluble solid + water  
miscible liquid)

Tests	Observation	Inferences
For water insoluble Solid		
i) 0.01 g of mix + sat NaHCO <sub>3</sub> shake till the effervescence stops filter	Acidifying with HCl → solid reappears	Carboxylic acid is present
ii) Residue from above Test washed 2-3 times with NaHCO <sub>3</sub> & remove	No solid reappears	Phenol absent

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acid Residue + 10% NaOH Shake filters		Neutral compound is present
i) Residue washed 2-3 times with aq. HCl to remove base. Residue is insoluble in all above reagents	-	
ii) Residue from above test washed 2-3 times with NaOH to remove phenol. Residue + 1:1 HCl Shake & filters	No solid reappears	Base absent
iii) For waters miscible liquid. i) water extract (WE) + sat. NaHCO <sub>3</sub>	No effervescence	carboxylic acid absent.
ii) WE + aq. FeCl <sub>3</sub>	No violet colour	phenol absent
iii) WE + red litmus papers	papers not turn blue	Base absent
iv) None of the above tests is positive	-	Liquid is water miscible neutral.

Conclusion :- chemical type of given mixture is

- i) water Insoluble Acid
- ii) water Insoluble Neutral
- iii) water miscible Liquid

• separation of solid - solid - liquid mixture :-  
A. Separation method :-

#### Distillation

In Distillation flask

- Insoluble solid

- Insoluble solid + sat. NaHCO<sub>3</sub>

↓  
Filtrate

- Filtrate + conc. HCl

- solid reappears

- water insoluble solid

↓  
Residue

- water insoluble

Neutral

In collector flask

- Volatile liquid

- water miscible

- neutral liquid



B. yield of the separating compound ;

i) weight of waters Insoluble Acid = 0.9 g

ii) weight of waters Insoluble Neutral = 0.7 g

iii) weight of waters miscible liquid = 2.5 ml

Identification of organic compound : I

(waters Insoluble Neutral)

- Preliminary test :

Tests	observation	Inferences
Nature	Solid	Carbohydrates, acid amines, etc. may be present.
Colour	white	Carbohydrates, aromatic, amides, aromatic hydrocarbon etc.
odours	Fruity	Aromatic hydrocarbon esters etc.

Ignition Test :-

Heat the compound on oxidised copper foil.

Test for unsaturation

kmno<sub>4</sub> Test :-

Add dil kmno<sub>4</sub> to small amount of compound & shake

Decolourisation unsaturated or easily oxidisable compound may be present.

- Detection of Elements (N, S & Halogen) :
  - preparation of Lassaigne Filtrate (Sodium fusion extract) :-
  - i) Heat small piece of sodium metal in dry fusion tube

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til it melts.

- ii) Add small amount of compound to the molten solution.  
iii) After initial reaction, heat the fusion tube to red heat & drop in distilled water taken in porcelain dish covering it immediately with asbestos sheet.  
iv) Carry two more fusion & concentrate the content to half the volume.  
v) Cool & filter. Test filtrate the litmus action. It should be b  
vi) Test the filtrate for following reactions.

Tests	Observation	Inferences
0.5 cm <sup>3</sup> filtrate + freshly FeSO <sub>4</sub> , boil, cool & add excess of dil. H <sub>2</sub> SO <sub>4</sub>	No green colour	Nitrogen absent
0.5 cm <sup>3</sup> filtrate + 5% sodium nitroprusside	No violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> Add AgNO <sub>3</sub>	No precipitate	Halogen absent

Conclusion: The given compound contain C, H, Cl elements.

Determination of functional group of compounds:-

Group I: Compounds containing C, H, Cl elements:-

Tests	Observations	Inferences
Test for hydrocarbon Iodine Test:- Dissolve 2-3 drops or 0.02 g compound in benzene + 2 cm <sup>3</sup> dil. I <sub>2</sub> in benzene. Shake	Solutions remain violet in colour	Hydrocarbon present

Conclusion:- The given compound contain hydrocarbon functional group.



Physical constant

melting point

Name &amp; structure of the compound

70°C

Diphenyl

Identification of organic compound : II

(waters miscible Neutral)

Preliminary Tests :-

Tests	Observation	Inferences
Nature	liquid	carbohydrates absent alcohol, ketones, etc.
Colours	white	may be present ketones, alcohols, esters, lactoses, etc.
Odours	pleasant	Alcohols, etc.
Ignition Test:		Aromatic or aliphatic
Heat compound in an oxidised copper foil	sooty flame	Compound containing more than four carbon
Test for unsaturation		
kmno <sub>4</sub> test:		
Add dil. kmno <sub>4</sub> to small amount of compound & shake	No decolourisation	Saturated compound Present

- Detection of Elements (N, S & halogen):  
preparation of Lassaigne filtrate (Sodium fusion extract)

i) Heat small amount of sodium in dry fusion tube till it melts.

ii) Add the compound to it (if liquid, 2-3 drops).

- iii) After the initial reaction, heat the fusion tube to red heat and drop it in distilled water taken in porcelain dish and covering immediately with asbestos sheet.
- iv) Carry two more fusion & concentrate the content of dish to half its volume.
- v) cool & filter. Test the filtrate for litmus action. It may be basic.

vi) Use filtrate for further test:

Tests	Observation	Inference
0.5 cm <sup>3</sup> filtrate + Fresh Sat. FeSO <sub>4</sub> soln, cool & excess of dil. H <sub>2</sub> SO <sub>4</sub>	No green colour	Nitrogen absent
0.5 cm <sup>3</sup> filtrate + 5% of sodium nitroprusside	No violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> Add AgNO <sub>3</sub>	No precipitate	Halogen absent

Conclusion: The given compound contains C, H, [O] elements

Determination of functional group of compounds:

Group I: Compounds containing C, H, [O] elements:

Tests	Observation	Inferences
Test for alcohols: Compound (if liquid) in dry test tube + sodium metal	Effervescence due to formation of H <sub>2</sub> gas.	Alcoholic -OH group present.

Conclusion: The given compound contains Alcohol functional group.

Physical constant:

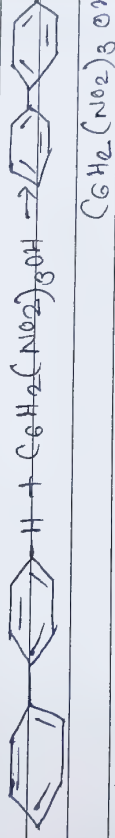
Physical constant	Name & structure of the compound
Melting point 78°C	Ethyl alcohol <chem>CH3-CH2-OH</chem>



Derivative of water insoluble Neutral :-  
(picrate derivative of Hydrocarbon) :-

- procedure :-
- i) Dissolve 0.5 g of compound in 1 cm<sup>3</sup> of benzene in dry test tube & add 1 cm<sup>3</sup> of saturated solution of picric acid in benzene
- ii) Shake and warm the mixture of necessary on hot water bath. Cool it to room temp.
- iii) The product separates out. Filter it & wash it with few drops of benzene
- iv) Dry by pressing filter paper & determine the melting point.

• Reaction :-



• Physical constant

The melting point of picrate derivative of hydrocarbon is 220°C.

• Purification of compound :-

i) Purified compound : water insoluble Acid

ii) Method of purification : Recrystallization

iii) Solvent used for purification : water

iv) Yield of purified product : 0.8 g

→ melting point of purified product:  $121^{\circ}\text{C}$



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Results :-

## Identified Compound : I

compound	Elements functional	physical	name & Derivative
Identification	Detected Group	constant structure	partition with
waters	Carbon C, Hydro	melting point	Diphenyl picrate deriva-
insoluble	Hydrogen H Carbon	point	tive of hydro-
Neutral	oxygen (O)	-70°C	carbon melting
			point = 0.28°C.

## Identified compound : II

compound	Elements functional	physical	name & structure
Identification	Detected Group	constant	of compound
waters	Carbon C, Alcoholic	melting	Ethyl alcohol
miscible	Hydrogen H (-OH)	point	C <sub>2</sub> H <sub>5</sub> -OH
Liquid	oxygen (O) group	78°C	

## purified compound

purified compound	yield of product	physical constant
waters Insoluble		melting point
Acid	0.8 g	= 121°C.

Vishal

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Ternary mixture - IV

Date

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Type: Solid-Liquid mixture

Solubility Test:-

Tests	Observation	Inferences
i) Mixture + H <sub>2</sub> O shaken well & allowed to stand	a) Solid does not dissolve b) Two layers are formed	water Insoluble Solid Present water Immiscible Liquid Present
ii) Aqueous layer from above test is heated till all liquid evaporates	Solid reappears	water Soluble Solid Present

Conclusion: The compounds in the given mixture are  
 water Insoluble solid, water Soluble solid  
 & water Immiscible liquid.

Determination of chemical type:

(water Insoluble solid + water Soluble solid + water Immiscible liquid)

Tests	Observations	Inferences
For water Insoluble Solid		
i) 0.01 g of mixture + sat. NaHCO <sub>3</sub> . Shake well till effervescence stops. Filter.	Strong effervescence before filtration Acidifying filtrate with conc. HCl → a solid reappears	Carboxylic acid is Present Carboxylic acid is confirmed
For water Soluble Solid		
0.01 g mixture + H <sub>2</sub> O		

Sriyam

Teacher's Sign.



Shake & Filter Filterate + Sat. $\text{NaHCO}_3$	Effervescence	Water Soluble xylic acid is present
For water immiscible liquid		
i) Liquid + sat. $\text{NaHCO}_3$ Shake. Two layers formed	No effervescence No two layers	Carboxylic acid absent
ii) Liquid + dil. $\text{NaOH}$ excess Shake. Two layers formed	Aqueous layer + 1:1 HCl fill acidic $\rightarrow$ no. two layers	phenol is absent
iii) Liquid + 1:1 HCl. Shake Well two layers formed	Aqueous layer + 20% $\text{NaOH} \rightarrow$ No emulsion	Base is absent
iv) All the above tests are negative		The liquid is neutral Compound

Conclusion: Chemical type of given mixture is

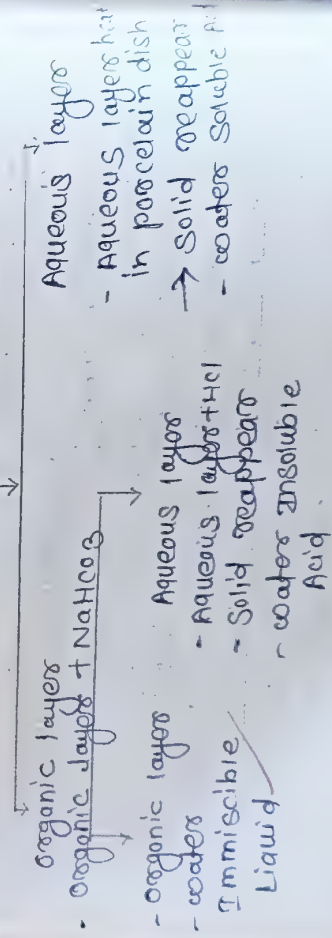
- water Insoluble Acid
- water Soluble Acid
- water Immiscible Neutral

• Separation of solid - Liquid mixture:-

A. Separation method:-

In separating funnel

Mixture +  $\text{H}_2\text{O}$



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## B. Yield of the separating compound:

- i) weight of waters Insoluble Acid = 0.7 g  
 ii) weight of waters Insoluble Acid = 0.8 g  
 iii) volume of waters Immiscible Neutral = 3.5 ml

• Identification of organic compound: I  
 (waters Insoluble Acid)

• Preliminary Test:

Tests	Observations	Inferences
Nature	Solid	Carbohydrates, acid, ketone, amide, etc.
Colour	white	may be present
odours	pungent & irritating	carbohydrate acid anilides, esters etc
Ignition Test: Heat compound on an oxidised (coppers foil) Test for unsaturation: kmno <sub>4</sub> Test: Add dil. kmno <sub>4</sub> to comp and shake		Acetic acid, acid halides, etc
	sooty flame	Aromatic or aliphatic compound more than four carbon atoms
		unsaturated or easily available
	Decolourisation	oxidisable comp
		may be present

• Determination of Elements (N, S & Halogens):

Preparation of Lassaigne Filtrate (Sodium Fusion extract)

- i) Heat small piece of sodium metal in dry fusion tube till it melts.  
 ii) Add small amount of compound to it.  
 iii) After that, heat the tube till it red heat and then put it

Evaluation

Teacher's Sign



in distilled water take in porcelain dish and covers it with asbestos sheet.

- iv) Carry out two more & concentrate the contents to half its volume.  
 v) Cool & filter. Test for litmus action. It should be basic.  
 vi) Use the filtrate for the following reactions.

Tests	Observations	Inferences
0.5 cm <sup>3</sup> filtrate + Fresh sat. FeSO <sub>4</sub> soln, cool & excess dil. H <sub>2</sub> SO <sub>4</sub>	No green colour	Nitrogen absent
0.5 cm <sup>3</sup> filtrate + 5% Sodium nitroprusside	No violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> + AgNO <sub>3</sub>	No precipitate	Halogen absent

Conclusion: The compound contains C, H, [O] elements

Determination of functional group of compound:

Group I: Compounds containing C, H, [O] elements

Tests	Observations	Inferences
Test for Carboxylic acid:- i) compound + sat. NaOH	Soluble with brisk effervescence	Carboxylic acid -COOH present
ii) compound + H <sub>2</sub> O + neutral FeCl <sub>3</sub>	Yellow colour	Cinnamic acid

Conclusion: The compound contains Carboxylic acid functional group

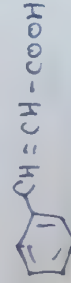
• Physical constant:

melting point

Name & structure of compound

193°C

Cinnamic acid



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• Identification of organic compound - II  
(Carboxylic Acid)

Preliminary Test:

Tests	Observations	Inferences
Nature	Solid	Carbohydrate, phenol, acids, amines, etc.
•		may be present
Colour	white	Aromatic, acids, amide
Odour	pungent & irritating	anilides, ketones, etc.
		Acetic acid, acetic anhydride, etc.
Ignition test:		Aromatic & aliphatic
Heat compound on oxidised copper foil.	Sooty flame	compound containing more than 4 carbon.
Test for unsaturation		
kmno <sub>4</sub> test:		unsaturated or easily oxidisable compound
Add dil. kmno <sub>4</sub> to small amount of compound & shake.	Decolourisation	may be present

• Detection of Elements (N, S, halogen):

Preparation of Lassaigne filtrate (sodium fusion extract)

- i) Heat small piece of sodium metal in dry fusion tube till it melts.
- ii) Add a small amount of compound to molten sodium.
- iii) Heat the fusion tube to red heat & drop it in 5 cm<sup>3</sup> distilled water in porcelain dish covering immediately with adhesions sheet.
- iv) Carry out two more & concentrate the content of dish to half in volume.

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v) cool & filter test the filtrate for litmus action. It should be basic.

vi) use the filtrate for further reactions:

Tests	Observations	Inferences
0.5 cm <sup>3</sup> filtrate + fresh FeSO <sub>4</sub> , boil, cool & add excess of dil. H <sub>2</sub> SO <sub>4</sub> .	No green colour	Nitrogen absent
0.5 cm <sup>3</sup> filtrate + 5% Sodium nitroprusside	No violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> . Add AgNO <sub>3</sub>	No precipitate	Halogen absent

Conclusions :- The given compound contains C, H, [O] elements determination of functional group of compounds :-  
Group I : compounds containing C, H, [O] elements:

Tests	Observations	Inferences
Test for Carboxylic Acid		
i) compound + NaHCO <sub>3</sub> Saturated solution	Soluble with brisk effervescence	Carboxylic acid -COOH present
ii) Compound + H <sub>2</sub> O + few drops of Neutral FeCl <sub>3</sub>	Red colour	Succinic acid

Conclusion :- The given compound contains Carboxylic functional group  $\text{Ar}-\text{COOH}$ .

Physical Constant :-

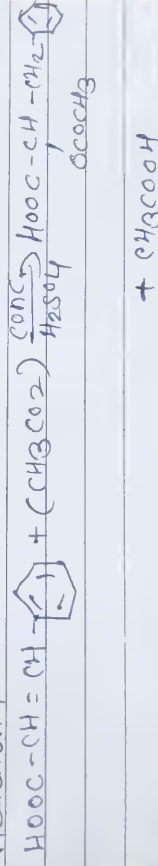
melting point	Name & structure of compound
185°C	Succinic Acid $\begin{array}{c} \text{CH}_2-\text{COOH} \\   \\ \text{CH}_2-\text{COOH} \end{array}$

### Derivative of water Insoluble Acid:- (Acetyl derivative of hydroxy acids)

#### procedure:-

- Take 1 g of Compound in dry test tube
- Add 2 cm<sup>3</sup> of acetic anhydride + 1 drop of conc. H<sub>2</sub>SO<sub>4</sub>
- Heat to boiling, cool & pour the content into 10 cm<sup>3</sup> of cold water in a dish.
- If solid does not separate out, heat for 2 min cool & shake well
- Filter the solid product, wash with H<sub>2</sub>O.
- Dry & determine the melting point.

#### Reaction:-



#### physical constant:-

The melting point of acetyl derivative of hydroxy acid is 170°C.

#### Purification of Compound:-

- Purified Compound: water Immiscible Neutral

#### Method of Purification:- Distillation

- Volume of purified product (2.8 ml)

- Boiling point of purified product: 202°C

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


### Results

#### Identified compound : I


Compound	Elements	Functional group	Physical constant	Derivative test
Identification	Detected	Group	constant	Structure formation

Compound melting point

Water	Carbon c.	Carboxylic	melting	cinnamic	Acetyl derivative
Insoluble	Hydrogen H	acid	Point	acid	of hydroxy acid
Acid	Oxygen (O)	-COOH	-133°C		CH <sub>3</sub> COOH melting point

#### Identified compound : II

Compound	Elements	Functional group	Physical constant	Derivative test
Identification	Detected	Group	constant	Structure formation

Water	Carbon c.	Carboxylic	melting	Quercinic acid
Soluble	Hydrogen H	acid	Point	CH <sub>2</sub> -COOH
Acid	Oxygen (O)	-COOH	-185°C	

#### Purified compound :

Purified compound	Yield of product	Physical constant
Water: Immiscible	2.8 ml	Boiling point
Neutral		= 98

Type: Liquid-Liquid-solid mixture

Solubility Tests:

Tests	Observations	Inference
1) mixture + water	a) two layers are formed	water immiscible liquid
shake well & allow to stand	b) solid does not dissolve	water insoluble solid
	c) Aqueous layer is heat & evaporate	water miscible liquid

Conclusion: The mixture contain water immiscible liquid, water miscible liquid & water insoluble solid.

Determination of chemical type:

(water immiscible liquid + water miscible liquid + water insoluble solid)

Tests	Observations	Inference
For water insoluble solid		
0.01 g of mixture, 1-2 ml 5% NaOH soln. shake till effervescence stops. Filter.	Strong effervescence before filtration. Acidifying with conc. HCl → solid reappears.	Carboxylic acid is present. Carboxylic acid is confirmed.
For water miscible liquid		
0.5 cm <sup>3</sup> liq. + 2 cm <sup>3</sup> H <sub>2</sub> O		



shake & take waters reactant			
waters extract + sat. $\text{NaHCO}_3$	No strong effervescence		Carboxylic acid absent
WE + aq. FeCl <sub>3</sub> solution	No violet colour		phenol absent
WE + red litmus paper	papers not turn blue		Base absent
None of above tests is positive			waters miscible neutral is present
For waters immiscible liquid			
Liquid + sat. $\text{NaHCO}_3$	No strong effervescence		Carboxylic acid absent
two layers are formed			phenol absent
Liquid + dilute $\text{NaOH}$ excess			
shake, two layers are formed	Aq. layers + 1:1 H <sub>2</sub> O → two layers		
Liquid + 1:1 H <sub>2</sub> O excess			
shake, two layers formed	Aq. layers + 20% $\text{NaOH}$ → no emulsion		Base absent
All the above tests are negative			Neutral compound is present

Conclusion :- chemical type of given mixture is

- waters immiscible neutral
- waters miscible neutral
- waters insoluble acid

• separation of liquid - liquid - solid mixture :-

A. separation method :-

#### Distillation

In Distillation flask

• waters insoluble solid

+ waters immiscible liquid

↓ separating funnel

organic layer

waters immiscible

Neutral

+ sat.  $\text{NaHCO}_3$

aqueous layer

• aqueous layer

• solid disappear

• waters insoluble

In collector flask

- volatile liquid

- waters miscible neutral

g. yield of the separating compound :-  
 i) volume of water immiscible liquid = 8.5 ml  
 ii) volume of water miscible neutral = 24.5 ml  
 iii) weight of water insoluble Acid = 0.7 g

Identification of organic compound : I  
 (water miscible neutral)

Tests	Observations	Inferences
Nature	Liquid	carbohydrates, alcohols, ketones, esters, etc.
Colour	Colourless	carbohydrates, alcohols, ketones, esters, etc.
Odour	Pleasant	alcohols, ketones, esters, etc.
Ignition test :-		
Compound on oxidised	Non sooty flame	Aliphatic compound
Copper foil		
Test for unsaturation		
Kmno <sub>4</sub> test :-		
Add. dil. kmno <sub>4</sub> to	No Decolourisation	Saturated compound
Small amount of		und
the compound & shake		

Determination of Elements (N, S, and Halogens)

Preparation of Lassaigne's Filtrate (Sodium Fusion)

1) Heat small piece of sodium metal in dry fusion tube (extreme) :-

ii) Add small amount of compound to molten sodium.

Heat the fusion tube to red heat & then drop it in

Teacher's Sign:

Signature



5 cm<sup>3</sup> distilled water taken in porcelain dish covering immediately with an asbestos sheet.  
 (i) Carry out two more fusion & concentrate the content of dish to half of its volume.  
 (ii) Cool & filter solution. Test for lithium action. It should be basic.  
 (iii) Test the filtrate for following reactions:

Tests	Observations	Inference
0.5 cm <sup>3</sup> filtrate + freshly FeSO <sub>4</sub> soln, cool & add excess of dil. H <sub>2</sub> SO <sub>4</sub>	No green colour	Nitrogen absent
0.5 cm <sup>3</sup> filtrate + 5% Sodium nitroprusside solution	No violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> . Add AgNO <sub>3</sub>	No precipitate obtained	Halogen absent

Conclusion: The given compound contains C, H, Cl, elements  
 Determination of the functional group of compounds:  
 Group I: compounds containing C, H, Cl, elements

Tests	Observation	Inferences
Test for alcohols Compound (if liquid) in dry test tube + sodium metal	Efferescence due to formation of H <sub>2</sub> gas	Alcoholic - OH group present

Conclusion: The given compound contains alcoholic functional group

Physical constant	Name & structure of compound
melting point	ethyl alcohol
78°C	C <sub>2</sub> H <sub>5</sub> -OH

Preparation of Lassaigne's filtrate (Sodium fusion extract)  
 1) Heat small piece of sodium metal in dry fusion tube till it melts.  
 2) Add small amount of substance to molten sodium.  
 3) Heat the fusion tube to red heat & drop it in 5 cm<sup>3</sup> distilled water taken in porcelain dish covering it.

Detection of elements (N, S & halogen):-

Tests	Observations	Inferences
Nature	Liquid	Carbohydrates, esters, ketones, alcohol, etc.
Colour	Colourless	Ketones, esters, alcohols, aldehydes etc.
Odour		
Ignition Test:	Heat the compound on a sooty flame	Aromatic or aliphatic compounds
Test for unsaturation		
Kmno <sub>4</sub> test:		
Add few drops of dil. Kmno <sub>4</sub> to small amount of compound	Decolourisation	Unsaturation or easily oxidisable
Shake		May be present

Preliminary tests:

(Water Immiscible Neutral)

Identification of organic compound: II

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immediately with an asbestos sheet.  
 (iv) Careg out too more & concentrate the content of dish & half the volume.  
 (v) Cool & filter the solution. Test for litmus action. It should be basic.  
 (vi) Test the filtrate for the following reaction.

tests	observations	Inferences
0.5 cm <sup>3</sup> filtrate + freshly FeSO <sub>4</sub> sol. & add excess of dil. H <sub>2</sub> SO <sub>4</sub>	No green colour	Nitrogen absent
0.5 cm <sup>3</sup> filtrate + 5% Sodium nitroprusside solution	No violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> . Add AgNO <sub>3</sub>	No precipitate	Halogen absent

Conclusion :- The given compound contain C, H, [O] element.  
 determination of functional group of compound :  
 Group ± :- compound containing C, H, [O] elements

tests	observation	Inferences
Tests for ketone compound + NaOH + 2-3 drops of Sodium nitroprusside solution	wine red colour or orange red colour	Lower ketone present

Conclusion :- The given compound contain ketone functional group.

Physical constant :-

melting point + boiling point	Name & structure of compound
202°C	Acetophenone <chem>CC(=O)c1ccccc1</chem>

Derivative of water miscible Neutral :-

(Iodoform derivative of aldehyde & ketones)

procedure :-

1) Take 1 cm<sup>3</sup> of compound in small 100 cm<sup>3</sup> conical flask

and add to it 8 cm<sup>3</sup> 2 N NaOH solution.

2) Now add saturated iodine solution with constant

stirring till pale yellow colour of solution persists.

3) Now heat the flask on boiling water bath for 10-15 min.

4) If yellow colour disappears, then add little more of

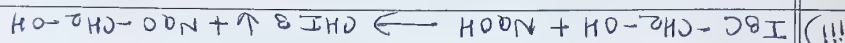
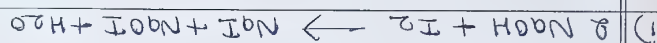
iodine solution.

5) Cool and filter the solid product, wash it with H<sub>2</sub>O

6) Recrystallise from alcohol.

7) Filter dry & determine melting point.

Reactions :-



Physical constant :-

The melting point of derivative Iodoform of alcohol is 119°C.

Purification of compound :-

1) purified compound : water insoluble Acid

2) Method of purification : Recrystallization

Teacher's Sign:



- !!!) solvent used for purification: unknown
- iv) yield of purified product: 0.68
- v) melting point of product: 120°C

Teacher's Sign:

*Handwritten signature*

Identified compound: (II)			
Compound	Elements	Functional	Physical
Identification	detected	Group	constant
soluble	Carbon, C, lower	Boiling	Acetophenone
Neutral	Hydrogen	point = 200°C	
	(oxygen co)	group	
purified compound			
purified compound	yield of product	physical constant	melting point = 120°C

Identified compound: I			
Compound	Elements	Functional	Physical
Identification	detected	Group	constant
soluble	Carbon, C, aliphatic	Melting	Ethyl
Neutral	Hydrogen	point = 78°C	alcohol
	(oxygen co)	group	
Derivative preparation			
Derivative preparation	Name & structure of	Compound	with melting point
			Toluenesulfonyl
			alcohol
			melting point = 119°C

Results:-

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## Type :- Liquid - Liquid - Solid mixture

### Solubility Tests :-

Tests	Observations	Inferences
1) Mixture + H <sub>2</sub> O	a) Solid does not dissolve in H <sub>2</sub> O	water insoluble
Shake & allow to stand	b) Two layers are formed	water insoluble
1) Mixture on water the quantity of	the quantity of	water miscible
Mass & check after mixture decreased	liquid present	
Some time	gives no layer	in aqueous solution

Conclusions :- The compounds in the mixture are water insoluble liquid, water miscible liquid & water insoluble solid

### Detection of chemical type :-

(water insoluble liquid + water miscible liquid + water insoluble solid)

Tests	Observations	Inferences
For water Insoluble		
Solid		
0.01 g mixture + 1-2 cm <sup>3</sup>		
Get. NaHCO <sub>3</sub> shake till effervescence stop.	No strong effervescence solid does not	is absent
Residue + NaHCO <sub>3</sub> same	Acidifying with 1:1 HCl → solid	phenol is present
NaOH solution filter	reappears	

Teacher's Sign:

For water miscible liquid		
crude extract (WE) + sat. NaHCO <sub>3</sub>	No strong effervescence	Carboxylic acid absent
WE + aq. FeCl <sub>3</sub>	No blue colour	phenol is absent
WE + red litmus paper	paper not turn blue	Base is absent
None of above tests is positive		Neutral is present
For water immiscible liquid		
Liq + NaHCO <sub>3</sub> , two layers	No effervescence Aq. + 1:1 HCl → no layers	carboxylic acid absent
Liq + dil. NaOH Shake	Aq. + 1:1 HCl → no emulsion	phenol absent
two layers are formed		
Liq + 1:1 HCl. Shake	Aq. + 20% NaOH → gives emulsion	Base present
two layers		

### Conclusions

Chemical type of mixture are:-

- i) water immiscible Base
- ii) water miscible Neutral
- iii) water insoluble phenol

Separation of liquid-liquid-solid mixture:-

### A. separation method

#### Distillation

#### In distillation flask

- water insoluble phenol + water immiscible Base + NaOH

#### In collector flask

- volatile liquid
- water miscible

#### In separating funnel

- organic layer
- water immiscible Base

- Aqueous layer
- Aqueous layer + HCl
- organic layer → water insoluble phenol



B. yield of the separating compound :-

- i) volume of water immiscible Base, (2.8 ml)  
 ii) volume of water miscible Neutral (3.5 ml)  
 iii) weight of water insoluble phenol = (6.6 g)

Identification of organic compound : I  
(water miscible Neutral)Preliminary tests :-

Tests	Observations	Inferences
Nature	Liquid	Alcohols, ketone, aldehyde, etc. may be present
Colour	Colourless	Amides, anilides, alcohols, ketones, etc.
Odour	Fruity	Aromatic hydrocarbons, esters, etc.
<u>Ignition Test :-</u>		
Heat compound on an oxidised copper foil	No sooty flame	Aliphatic compound
Test for unsaturation		
Permnoy Test :-	No decolourisation	Saturated compound
Add dil. permnoy to compound & shake		

• Detection of Elements (N.S. & halogen) :-

- i) Preparation of Lassaigne filtrate (Sodium fusion extract)  
 Heat small amount of Sodium in dry fusion tube till it melts.  
 ii) Add small amount of compound to molten Sodium.

- iii) Heat it again till it becomes red hot & drop it in the water taken in porcelain dish immediately covering with asbestos sheet.
- iv) Carry out two more & concentrate the contents to its half of volume.
- v) Cool & Filter. Test for litmus action. It should be basic.
- vi) Test the filtrate for following reactions.

Tests	Observations	Inferences
0.5 cm <sup>3</sup> filtrate + Fresh FeSO <sub>4</sub> soln, cool + dil. H <sub>2</sub> SO <sub>4</sub> in excess	No. green colour	Nitrogen absent
0.5 cm <sup>3</sup> filtrate + 2-3 drops 5% Sodium nitro-prusside	No violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> Add AgNO <sub>3</sub>	No precipitate	Halogen absent

Conclusion: The given compounds contain C, H, [O] elements.

- Determination of functional group of compounds:-

Group I:- Compounds containing C, H, [O] elements

Tests	Observations	Inferences
Test for ketone Compound + NaOH + 2-3 drops of Sodium nitro prusside solution	wine red colour	Lower ketone present

Conclusion:- The given compound has ketone functional group.

Physical constant:-

Boiling point	Name & structure of compound
80°C	Ethyl methyl ketone $\text{H}_3\text{C}-\overset{\text{O}}{\parallel}-\text{CH}_2-\text{CH}_3$



## Identification of organic compound : II (water immiscible base)

### • Preliminary Test :-

Tests	Observations	Inferences
Nature	Liquid	Alcohols, ketones, esters, ethers, etc.
Colour	yellow	may be present nitro compound etc.
odour	fishy	Amines, aniline, etc
Ignition test :-		Aromatic compound
Heat the compound on an oxidised copper foil	Sooty flame	containing more than four carbon atoms.
Test for unsaturation		
kmno <sub>4</sub> test :-		
Add. dil kmno <sub>4</sub> to small amount of compound & shake	Decolourisation	unsaturated or easily oxidisable compound may be present.

### • Detection of Elements (N, S and halogen) :-

Preparation of Lascagne Filtrate (Sodium) Fusion extract)

- Heat Small piece of Sodium metal in dry fusion tube till it melts.
- Add dry substance to the molten Sodium.
- Heat the tube to red heat & chop it in distilled water taken in porcelain dish covering it immediately with an asbestos Sheet.
- Carry two more fusions & concentrate the content of dish to half its volume.

v) cool & filter. Test the filtrate for litmus action. It should be basic

vi) Test the filtrate for following reactions:

Tests	Observations	Inferences
0.5 cm <sup>3</sup> filtrate + FeSO <sub>4</sub> Fresh boil, cool & dil. H <sub>2</sub> SO <sub>4</sub> excess	Green colour	Nitrogen present
0.5 cm <sup>3</sup> filtrate + drop of 5% Sodium nitroprusside	No Violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> Add AgNO <sub>3</sub>	No precipitate	Halogen absent

conclusions :- The given compound contain C, H, [O] element.

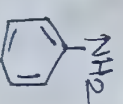
• Determination of functional group of compounds:-

Group II:- compounds containing C, H, [O] & N elements:

Tests	Observations	Inferences
Test for amines:- Dissolve compound in dil. HCl, cool in ice + cold 2% NaNO <sub>2</sub> solution	A clear solution which when added to solution of $\beta$ -naphthol in NaOH gives orange-red dye	Aromatic primary amine (-NH <sub>2</sub> ) group present.

Conclusions :- The given compound contain Aromatic primary  
amino (-NH<sub>2</sub>) group.

Physical constant :-

Melting point /	Name & Structure of compound
Boiling point 183°C	Aniline 



• Derivative of ester miscible neutral :-

Iodoform derivative of aldehyde & ketones :-

Preparation :-

- i) Take 1cm<sup>3</sup> compound in conical flask & add 8cm<sup>3</sup> of 2N NaOH solution.
- ii) Add. sat iodine solution with constant stirring till pale yellow colour of solution persists.
- iii) Heat the flask on boiling water bath for 10-15 min.
- iv) If yellow colour disappears, add little more of iodine.
- v) Cool & filter the solid product wash it with H<sub>2</sub>O & recrystallise it from alcohol.
- vi) Filter, dry & determine melting point.

• Reactions :-

- i)  $2\text{NaOH} + \text{I}_2 \rightarrow \text{NaI} + \text{NaOI} + \text{H}_2\text{O}$
- ii)  $\text{CH}_3 - \underset{\text{O}}{\underset{\text{||}}{\text{C}}} - \text{CH}_2 - \text{CH}_3 + 3\text{NaOI} \rightarrow \text{I} \underset{\text{O}}{\underset{\text{||}}{\text{C}}} - \text{CH}_2 - \text{CH}_3 + 3\text{NaOH}$
- iii)  $\text{I} \underset{\text{O}}{\underset{\text{||}}{\text{C}}} - \text{CH}_2 - \text{CH}_3 + \text{NaOH} \rightarrow \text{CH}_3\text{I} \& \text{CH}_3 - \underset{\text{O}}{\underset{\text{||}}{\text{C}}} - \text{ONa}$

Physical constant :-

The melting point of iodoform derivative is

121°C

Purification of compound :-

- i) purified compound :- water insoluble phenol

- ii) method of purification :- Recrystallization

iii) Solvent used for purification : water  
iv) yield of purified product : 0.4 g  
x) melting point of product :  $123^{\circ}\text{C}$



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Results:

## • Identified Compound : I

Compound	Elements Detected	Functional Group	Physical Constant	Name & Structure of compound	Derivative preparation with melting point
Water	Carbon	ketone	Boiling point	Ethyl methyl ketone	Iodoform test
Miscible	Hydrogen	Group			
Neutral	Oxygen (O)		$-80^{\circ}\text{C}$	$\text{H}_3\text{C}-\text{C}(=\text{O})-\text{CH}_3$	$=121^{\circ}\text{C}$

## Identified Compound : II

Compound	Elements Detected	Functional Group	Physical Constant	Name & Structure of compound
Water	Carbon C,	Aromatic	melting point	Aniline $\text{NH}_2$
Immiscible	Hydrogen H,	primary		
Base	Oxygen (O)	Amino $(-\text{NH}_2)$	$-18.3^{\circ}\text{C}$	
	Nitrogen (N)	Group		

## Purified Compound :

Purified Compound	Yield of compound	Physical constant
Water Insoluble	0.4 g	melting point $=128^{\circ}\text{C}$
phenol		

Gulshan

Teacher's Sign

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Ternary mixture-VII Page 31

## Type :- Liquid - Liquid - Liquid mixture

### Solubility Test :-

Tests	Observation	Inferences
Take mixture in a watch glass and wait for few minutes	Volume of quantity of mixture is decreased	Volatile liquid is present so water miscible liquid is present.
Mixture + H <sub>2</sub> O. Shake well and stand for 10 min	Three layers are observed	Two water immiscible liquid is present.

Conclusion :- The mixture contains water miscible liquid and 2 water immiscible liquid

### Determination of chemical type :-

(water miscible liquid + water immiscible liquid + water immiscible liquid)

Tests	Observation	Inferences
For water miscible liquid		
i) CO <sub>2</sub> + sat. NaHCO <sub>3</sub>	No effervescence	Acid absent
ii) CO <sub>2</sub> + aq. FeCl <sub>3</sub>	No violet colour	Phenol absent
iii) ME + red litmus	Not turn blue	Base absent
iv) None of the above test is positive	-	Neutral present
For water miscible liquid		
i) Diq + sat NaHCO <sub>3</sub>	No effervescence	



shake. Two layers are formed	No two layers	Acid absent
Liq + dil NaOH excess Two layers are formed	Aqueous layer + 1:1 HCl $\rightarrow$ no emulsion	phenol absent
ii) Liq + 1:1 HCl excess shake. Two layers are formed	Aqueous layer + 20% NaOH $\rightarrow$ emulsions obtained	Base present
iii) All the above tests are negative	-	Neutral present

conclusions: the given mixture contain chemical type:

- water miscible neutral
- water immiscible base
- water immiscible Neutral

• Separation of Liquid-Liquid-Liquid mixture:

A) separation method

Distillation

In distillation flask

2 water immiscible liquid

+ HCl

In collector's flask

= volatile liquid

= water miscible  
neutral

In separating funnel

organic layer

- water immiscible  
neutral

Aqueous layer

Aqueous layer

+ NaOH

organic layer

- water immiscible  
base

Aqueous layer

B. Yield of the separating compound :-

- volume of water miscible Neutral = 3 ml
- volume of water immiscible Base = 3.5 ml
- volume of water immiscible Neutral = 2.8 ml

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- Identification of organic compound : I  
(water miscible Neutral)

Tests	observations	inferences
Nature	liquid	lower aromatic hydrocarbon, alcohol ethers etc.
Colours	Colourless	Amides, esters, alcohol ketones etc.
Odours	Pleasant	Alcohols, etc.
Ignition Test :- Heat compound on an oxidised copper Foil.	No sooty	Aliphatic compound etc.
Test for unsaturation kmno <sub>4</sub> Test :- Add. dil kmno <sub>4</sub> to Compound & shake	No decolourisation	Saturated compound present.

Determination of elements (N, S and halogens) :-

preparation of Lassaigne filtrate (Sodium fusion extract)

- Heat small piece of Sodium metal in dry fusion tube till it melts.
- Add dry substance to the molten sodium.
- Heat it further to red heat & then drop it in a distilled water taken in a porcelain dish covering it immediately with an asbestos sheet.
- Carry out two more fusion & concentrate the contents to half its volume.
- Cool & filter test for litmus action. It should be basic.



vi) Test the filtrate for the reactions.

Tests	Observations	Inferences
0.5 cm <sup>3</sup> filtrate + prop. freshly sat. FeSO <sub>4</sub> , boil, cool & add excess dil. H <sub>2</sub> SO <sub>4</sub>	No green colour	Nitrogen absent
0.5 cm <sup>3</sup> filtrate + 5% sodium nitroprusside	No violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> + AgNO <sub>3</sub> solution	No precipitate	Halogen absent

Conclusion: The given compound contain C, H, [O] element

Determination of the functional group of compound:

Group I: Compounds containing C, H [O] elements

Tests	Observation	Inferences
Test for alcohols: Compound (if liq) + sodium dry + test tube	Effervescence due to formation of CH <sub>4</sub> (g)	Alcoholic -OH group present.

Conclusion: The given compound contain alcoholic functional group.

Physical constant:

Melting point Boiling point	Name & structure of the compound
78°C	Ethyl alcohol CH <sub>3</sub> -CH <sub>2</sub> -OH

Identification of organic compound: I  
(water immiscible neutral)

Tests	Observations	Inferences
Nature	Liquid	Alcohols, ketones, esters, ethers, etc may be present.

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Colours	white	Amides, anilides, ketones, esters, alcohols etc.
Odour	Sweet, strong	ketones, anilides etc.
Ignition Test: Heat comp. on an oxidised foil of copper.	Sooty flame	Ar. comp or aliphatic comp. containing more than 4-C
Test for unsaturation $\text{KMnO}_4$ test:		
Add. dil $\text{KMnO}_4$ to small amount of compound & shake	Decolourisation	unsaturated or easily oxidisable compound may be present.

- Detection of elements (N, S and halogen):  
Preparation of Lassaigne filtrate (sodium fusion extract):

- Heat freshly sodium metal in dry fusion tube till it melts.
- Add small amount of dry substance to molten sodium
- Heat it to further to red heat & drop it in distilled water taken in porcelain dish covering immediately with an asbestos sheet.
- Carry to more fusions & concentrate. The contents of dish to half its volume.
- Cool & filter. Test for litmus action. It should be basic.

Tests	Observations	Inference
0.5 cm <sup>3</sup> filtrate + fresh sat. $\text{FeSO}_4$	No green colour	Nitrogen absent



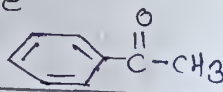
boil, cool add excess dil. $H_2SO_4$		
0.5 cm <sup>3</sup> filtrate + 5% sodium nitro-prusside solution	No violet colour	Sulphur absent
0.5 cm <sup>3</sup> filtrate + conc. $HNO_3$ + $AgNO_3$ solution.	No precipitate	Halogen absent

Conclusions: The given compound contains C, H, [O] elements.  
 • Determination of the functional group of compounds:  
 Group I: compounds containing C, H, [O] elements.

Tests	Observations	Inferences
Test for ketone Compound + NaOH + sodium nitroprusside solution	orange red colour	Lowers ketone present

Conclusion: The given compound contain ketone functional group.

• Physical constant

Boiling point	Name & Structure of the compound
202°C	Acetophenone 

Derivative of waters miscible Neutral:  
 (Acetyl derivative of alcohols)

• Preparation:-

- 1) Take 0.5 cm<sup>3</sup>/g of the compound taken in dry hand glass test tube, add 2 cm<sup>3</sup> of acetic anhydride and 2-3 drops of conc. Sulphuric acid.

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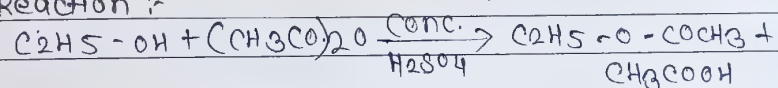
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- ii) warm the test tube on water bath for 10-15 min.
- iii) cool & pour in 20 cm<sup>3</sup> cold-water. product will separate out.
- iv) filter the product, recrystallise it from alcohol.
- v) filter, dry & determine the melting point.

• Reaction :-



• physical constant :-

The melting point of acetyl derivative of alcohol is 114°C

• purification of compound :-

- i) purified compound :- water immiscible base
- ii) method of purification : Distillation
- iii) volume of purified product :- 2.6 ml
- iv) Boiling point of purified product :- 184°C

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# Results :-

## Identified compound : I

Compound Identification	Elements Detected	Functional Group	Physical Constant	Name & structure of compound	Derivative preparation with melting point
Waters miscible	Carbon C, Hydrogen H	Alcoholic -OH group	melting point = 78°C	Ethyl alcohol <chem>CCO</chem>	Acetyl derivative of alcohol melting point = 114°C

## Identified compound : II

Compound Identification	Elements Detected	Functional Group	Physical Constant	Name & structure of compound
Waters immiscible	Carbon C, Hydrogen H	Lower ketone group	Boiling point = 202°C	Acetophenone <chem>CC(=O)c1ccccc1</chem>

# Purified compound :-

Purified compound	Yield of product	Physical constant
Waters immiscible		Boiling point
Base	2.6 ml	= 184°C

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Type: Liquid-Liquid-Liquid mixture  
So

Solubility Test:

Tests	Observations	Inferences
Take a mixture in watch glass and wait for few minutes	Quantity of mixture is not decrease	So volatile liquid is absent.
mixture + H <sub>2</sub> O. Shake well and stand for 10 minutes	Three layers are formed	So water immiscible liquid is present.

Conclusion: The compounds in the given mixture are three water immiscible liquid.

Determination of chemical Type:

(water immiscible liquid + water immiscible liquid + water immiscible liquid)

Tests	Observations	Inferences
For water immiscible liquid		
i) Liq + sat. NaHCO <sub>3</sub> Shake. two layers are formed.	Aq. layers + 1:1 HCl → no two layers	Carboxylic acid is absent.
ii) Liq + dil. NaOH excess Shake. two layers are formed.	Aq. layers + 1:1 HCl → emulsion formed	Phenol is present.
iii) Liq + 1:1 HCl excess Shake. two layers are formed.	Aq. layers + NaOH → emulsion formed	Base is present
iv) All the above tests are negative		Neutral is present



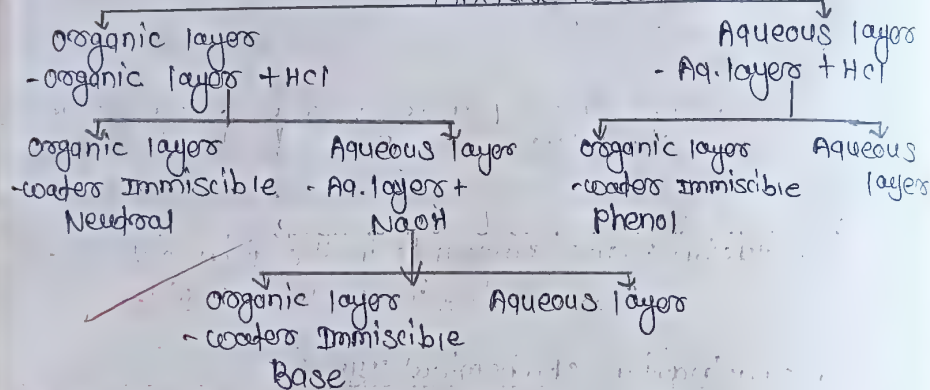
Conclusion : The chemical type of given mixture :-

- i) water Immiscible phenol
- ii) water Immiscible Base
- iii) water Immiscible Neutral

Separation of Liquid - Liquid - Liquid mixture :-

A. Separation method -

In separating funnel  
Mixture + NaOH



B. Yield of the separating compound :-

- i) Volume of water immiscible phenol = 3.2 ml
- ii) Volume of water immiscible Base = 3.5 ml
- iii) Volume of water Immiscible Neutral = 2 ml

Identification of organic compound :-

(water Immiscible Base)

• Preliminary Tests :-

Tests	observations	Inferences
Nature	liquid	Alcohols, ketones, esters, ethers etc. may be present.
Colour	Yellow	Nitro compounds, quinones etc.

odours	Fishy	Anilines, amines etc.
Ignition Test: Heat compound on an oxidised Copper foil.	Sooty	et Ar. comp. or aliphatic compounds containing more than 4-C atoms.
Test for unsaturation kmno <sub>4</sub> Test:-		unsaturated or easily oxidisable compound may be present.
Add few drops of very dil. kmno <sub>4</sub> to compound and shake	Decolourisation	

Detection of Elements (N, S, halogen):-

preparation of Lassaigne filtrate (Sodium fusion extract)

- Heat piece of sodium metal in dry fusion tube till it melts.
- Add small amount of dry substance to molten sodium.
- Heat it to red hot and drop it in distilled water taken in a porcelain dish covering immediately with asbestos sheet.
- Carry out two more fusion & concentrate the content in half its volume.
- Cool & filter. Test for litmus action. It should be basic.
- Test the filtrate for the reactions.

Tests	Observations	Inferences
0.5 cm <sup>3</sup> filtrate + fresh FeSO <sub>4</sub> soln, cool + dil. H <sub>2</sub> SO <sub>4</sub> excess	Green Colour	Nitrogen present
0.5 cm <sup>3</sup> filtrate + 5% Sodium nitroprusside	No Violet colour	Sulphur absent



5.5 cm<sup>3</sup> filtrate + conc. HNO<sub>3</sub> + AgNO<sub>3</sub> solution

No precipitate

Halogen absent

Conclusion: The given compound contains C, H, [O], N elements.

• Determination of the functional group of compound:  
Group I: compounds containing C, H, [O] + N elements.

Tests	Observations	Inferences
Test For Amines:- Dissolve compound in dil. HCl cool in ice + add 2% NaNO <sub>2</sub> sol <sup>n</sup>	pale yellow solid oil turning greenish on addn of NaOH	tertiary amino group present (N <sup>+</sup> )

Conclusion: The given compound contains tertiary amino functional group.

Physical constant:

Boiling point	Name & structure of the compound
193°C	dimethyl aniline <chem>CN(C)c1ccccc1</chem>

Identification of organic compound: II  
(Water Immiscible Neutral)

• Preliminary tests -

Tests	Observation	Inferences
Nature	Liquid	Lowers aromatic hydrocarbon alcohol, ketones etc. may be present
Colour	Whitish yellow	Aromatic hydrocarbons amides etc.
Odours	Bitters almonds	Nitro compounds aromatic aldehyde etc.

Ignition test :-

Heat compound on oxidised copper foil.

Sooty flame

Pres. comp. or alpha-dic compounds containing more than 4-C atoms

Test for unsaturation:Kmno<sub>4</sub> test :-Add. dil. kmno<sub>4</sub> to compound & shake

Decolourisation

unsaturated or easily oxidisable compound may be present.

• Detection of elements (N, S & halogens) :-Preparation of Lassaigne Filtrate (Sodium Fusion extract)

- i) Heat the sodium metal in dry fusion tube till it melts
- ii) Add small amount of dry substance to molten sodium.
- iii) Heat it to red heat & drop it in distilled water taken in porcelain dish covering it immediately with an asbestos sheet.

- iv) Carry out two more fusions & concentrate the contents of dish to half its volume.

- v) Cool & filter. Test the litmus action. It should be basic.

- vi) Test the filtrate for the following reactions.

Tests	Observations	Inferences
0.5 cm <sup>3</sup> filtrate + fresh FeSO <sub>4</sub> soln, cool & add excess dil. H <sub>2</sub> SO <sub>4</sub>	Green colour	Nitrogen absent
0.5 cm <sup>3</sup> filtrate + 5% sodium nitroprusside	No violet colour	Sulphur absent



0.5 cm <sup>3</sup> filtrate + conc. HNO <sub>3</sub> + AgNO <sub>3</sub>	No precipitate	Halogen absent
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
Conclusion :- The given compound contain C, H, [O], N elements.

- Determination of functional group of compounds :-  
Group :- compounds containing C, H, [O], N elements.

Tests	Observations	Inferences
Test for hydrocarbon Dissolve 2-3 drop of compound in benzene + 2 cm <sup>3</sup> dil. Fe in benzene Shake well	Remains violet in colour	Hydrocarbon present

Conclusion :- The given compound contain hydrocarbon functional group.

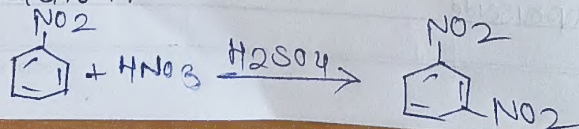
Physical constant :-

Boiling point	Name & structure of compound
210°C	Nitrobenzene 

- Derivative of water Immiscible Neutral :-  
Preparation :-

- Take compound in dry test tube.
- Add conc. HCl to it. Add pinch of Zn dust then boil & cool it.
- Add water and then NaOH solution drops of this solution to NaCl solution.
- violet colour is produced
- on warming with fuming HNO<sub>3</sub> & H<sub>2</sub>SO<sub>4</sub> gives m-dinitro benzene.

Reaction :-





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physical constant :-

The melting point of derivative of water immiscible Neutral is  $90^{\circ}\text{C}$ .

purification of compound :-

- i) purified compound : water immiscible phenol.
- ii) method of purification : distillation
- iii) yield of purified product : 3 ml
- iv) Boiling point of product :  $182^{\circ}\text{C}$



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## Results:-

## • Identified Compound :- I

Compound Identification	Elements Detected	Functional Group	Physical Constant	Name & Structure of compound
soluble in water	Carbon, C	Tertiary amino	Boiling point = 193°C	Dimethyl aniline <chem>CN(C)c1ccccc1</chem>
immiscible	Hydrogen, H	amino group		
Base	Oxygen, (O)			
	Nitrogen, N			

## • Identified compound :- II

Compound Identification	Element Detected	Functional group	Physical constant	Name & Structure of compound	Derivative Preparation with melting point
soluble in water	Carbon, C	Hydro-carbon	Boiling point	Nitrobenzene <chem>c1ccccc1[N+](=O)[O-]</chem>	Nitro derivative melting point = 90°C
immiscible	Hydrogen, H	Carbon			
Neutral	Oxygen, (O)				
	Nitrogen, N				

## • purified compound

purified compound	yield of compound	Physical constant
soluble in water immiscible phenol	3 ml	Boiling point = 182°C

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